What is claimed is:

Claim 1. An amplifier assembly for producing an amplified flux of neutrons, said assembly comprising:

a hollow support cylinder of moderator material, said hollow support cylinder having an inner surface and an outer surface;

a first thin layer of fissile material on said inner surface of said hollow support cylinder;

a neutron source within said hollow support cylinder for releasing a primary flux of neutrons that is received by said first thin layer of fissile material on said inner surface of said hollow support cylinder, said primary flux of neutrons comprising fast and/or thermal neutrons;

wherein said first thin fissile material layer has a thickness chosen to trap thermal neutrons but to allow fast neutrons to pass there-through without interaction, and said hollow support cylinder with said first thin layer of fissile material is dimensioned to achieve a criticality factor k_{eff} close to 1, so as to obtain a desired neutron amplification gain without risking to become critical, whereby said assembly produces an amplified flux of neutrons consisting of neutrons escaping through said outer surface of said hollow support cylinder.

Claim 2. The assembly according to claim 1, wherein:

said neutron source is a spallation target located along the axis of said hollow support cylinder, and

said assembly further comprises an accelerator capable of directing a proton beam axially through said hollow support cylinder onto said spallation target.

Claim 3. The assembly according to claim 1, wherein said neutron source is an intense spontaneous neutron emitter.

Claim 4. The assembly according to claim 1, wherein said criticality factor k_{eff} is about 0.95.

Claim 5. The assembly according to claim 1, comprising at least one second thin layer of fissile material, which is arranged in a concentric axial configuration between said first thin layer and said neutron source, wherein said hollow support cylinder with said first and second thin layer of fissile material is designed to achieve a criticality factor k_{eff} close to 1, so as to obtain a desired neutron amplification gain without risking to become critical.

Claim 6. The assembly according claim 5, wherein said second thin layer is self-supporting.

Claim 7. The assembly according claim 5, wherein said second thin layer is deposited on a metal tube.

Claim 8. The assembly according claim 1, wherein said moderator material is graphite.

Claim 9. The assembly according claim 1, comprising a thin outer layer of fissile material on said outer surface of said hollow support cylinder, said thin outer layer having a thickness chosen to trap thermal neutrons but to allow fast neutrons to pass there-through without interaction, whereby said amplified flux of neutrons consists only of fast neutrons escaping through said outer layer of fissile material.

Claim 10. The assembly according claim 1, wherein said hollow support cylinder includes coolant channels.

Claim 11. The assembly according claim 1, wherein said first thin layer of fissile material is covered with an internal layer of moderator material.

Claim 12. The assembly according claim 1, wherein said fissile materials comprise Am^{242m} or U^{235}.

Claim 13. The assembly according claim 1, comprising at least one rod of moderator material movably inserted in a free space inside said hollow cylinder so as to be able to control said criticality factor.

Claim 14. The assembly according to claim 3, wherein said intense spontaneous neutron emitter is Californium.